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ABSTRACT

Four papers from the Special Conference on Instructional Technology (San Antonio, Texas, December 4-6, 1970) discuss communication, production, and dissemination of instructional technology. The papers focus on such areas as the dissemination process for instructional media, by Raymond Wynn; and application of a total information packaging system for dissemination of research products, by G. Stephen Lilly; communicating technology, by Ted Ward; and building technology for the development of educational products, by Walter Borg. Other collections of papers from the conference have been compiled and are available as EC 031 520 (Adoption of Technology and Program Development), EC 031 521 (Instructional Technology for Personnel Training), EC 031 522 (The Improvement of Special Education through Instructional Technology), and EC 031 524 (The Use and Evaluation of Instructional Technology in the Classroom). (CD)

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Exceptional Children Conference Papers: Communication, Production, and Dissemination of Instructional Technology

Papers Presented at the

Special Conference on Instructional Technology

The Council For Exceptional Children

San Antonio, Texas

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PREFACE

Communication, Production, and Dissemination of Instructional Technology is a collection of four papers selected from those presented at the Special Conference on Instructional Technology, San Antonio, Texas, December 1 - 3, 1970. These papers were collected and compiled by The Council for Exceptional Children, Arlington, Virginia. Other collections of papers from the Conference have been compiled and are available from the ERIC Document Reproduction Service. Other collections announced in this issue of Research in Education may be found by consulting the Institution Index under Council for Exceptional Children or the Subject Index under Exceptional Child Education. Titles of these other collections are:

The Improvement of Special Education through Instructional Technology
The Use and Evaluation of Instructional Technology in the Classroom
Instructional Technology for Personnel Training
Adoption of Technology and Program Development

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The Dissemination Process for Instructional Media

Raymond Kinnan
University of Massachusetts

The dissemination process for instructional media might be perceived "dissemination on how to get a good thing started and going."

The climate for educational innovation is now very favorable. We are constantly made aware of a great variety of innovations that have been invented by competent people and seem to be acceptable to large numbers of teachers and their administrators and put into practice in a great variety of settings. Some of us can remember a time in education when innovations were few and far between. Comparing an educational journal of today with one of a few years ago would reveal many terms referring to innovation that are of very recent origin and emergence. Although many innovations are available to the teachers of handicapped children, we must not stop now, because the potential for improving education has never been so great.

Our primary concern is getting the fruits of the technological revolution available to handicapped children. The technological revolution has provided us with programmed learning, computers, sound systems, television, motion pictures, still pictures, systems, and building facilities that we have never had available in such abundance and of such quality before. To most of our classroom teachers these innovative devices, techniques, materials and facilities are somewhere on the fringes of education rather than central concerns. Our most important jobs are to determine which of these innovations can be adopted and adapted in a majority of the classrooms where they are needed, and then determine ways of assuring their adoption.

Changing education to desirable ways seems not to be a most difficult undertaking. Schools are probably the most conservative institutions that we have in our society at the present time. Some of us get very discouraged about this situation. It seems that schools and their practices remain as dead center when we are so anxious to have them move in a direction that we see as essential.

According to Gordon, "There are people who make things happen, there are people who watch things happen, and there are people who don't know that anything happened." There are too many of us in education who belong in the latter two groups.

I am reminded of the story about the businessman who returned to his home town after several years of absence. He visited the place where he had gone to market and found that his favorite store had been replaced by a beautiful and complex new supermarket. He went by the bank where he had *earned his first dollars and found that it too was changed completely.* He then visited the factory where he had first worked and found that it was completely changed. He then went to find his old school and it too was replaced by a remarkable new structure. He decided to look further and went inside these buildings. The inside of the supermarket was as different as it was on the outside. The inside of the bank revealed a world of technology that he had not known in the old bank. The inside of the factory was completely different. Everywhere technology was at work helping men to do a better job. So then he visited the school, and you know the answer. He found that activities inside the school were completely familiar to him because they were so similar to those that went on in the old school building which he remembered.

The story is now not all done. We do have many evidences that innovations are being adopted at least by some segment of our profession. This picture of the farmer with the report card in his hand, looking at the student, continues this. "The teacher says you don't pay attention to the closed circuit T.V.—you fool around during the film—you don't take care of your tapes—you play with your headset during the records." Yes, there is plenty of evidence that innovations are entering our schools and are being accepted by some of our teachers.

We are moving from a standardized curriculum to a *differentiated* curriculum. We are moving from standardized grouping to *differentiated* grouping. We are moving from standardized spaces to *differentiated* spaces. We are moving from a standardized time schedule to a *differentiated* time schedule. We are moving from standardized staffing to *differentiated* staffing. We are moving from standardized instructional material to differentiated instructional materials.

The old and the new can be contrasted in other ways. Whereas verbal symbols were the primary means of instruction in our classrooms, audio and visual symbols, either separately or in some combination, are now regularly used. Eight children has long been the accepted number of children to be taught at one time. We now have children learning individually or being taught individually or in various sized groups up to several times eight children for a presentation. Teachers were once considered universal; that is, they did everything that was to be done in teaching-learning situations. We now have teams of people including professional teachers and assistants and even machines during some of the instructional jobs. All rooms for education once looked alike and might have been called universal rooms. We are now making and using a great variety of special rooms for special purposes in education.

As far as audiovisual equipment is concerned, we are moving from an era of optional, temporary, and supplementary uses toward required, integrated and permanent equipment. It is interesting to note that the chalkboard never became popular while it was portable, but only when it became a permanent classroom appliance.

The teacher and his role as a concept seems to be gaining acceptance. A variety of people with special talents can do far more for our handicapped children than a single person can do.

Inquiry-oriented education seems to be gaining a lot of acceptance. This requires role changes for both teachers and students. The teacher becomes the stimulator, diagnostician, prescriber, environment planner, materials provider, discussant and evaluator whereas the student becomes the inquirer, materials manipulator, idea organizer, explorer, generalizer, discoverer, and communicator.

Individualized instruction is gaining wide acceptance. Children are becoming enthusiastic learners under their own power. After the teacher has provided appropriate stimulus, the individual student can go to a resource center and individually pursue his own interests and provide some sort of feedback to his peers and the teacher.

But we often get very discouraged at the lack of progress in accepting new ideas. Benjamin Franklin's quotation is particularly applicable to teachers. "But there is to mankind an unaccountable prejudice in favor of ancient customs and institutes, which believes to a continuance of them after the circumstances which formerly made them useful cease to exist." Resistance to change is certainly a common and continuing human characteristic. Alexander Pope said, "Be not the first by which the new is tried nor yet the last by which the old is put aside." The climate for innovation is better now than

when the alphabet was invented, and an egyptian said, "This invention of yours will create forgetfulness in the learners's souls because they will not use their memories, they will appear to be omniscient, and will generally know nothing." The cartoon of the man inventing the clay tablet is also appropriate. "Certainly this is the best method, people have done it this way for thousands of years."

Assuming that we have a good new idea for improving the education of the handicapped children, how do we get it accepted? It is easy to assume that the only requirement is exposure of the good idea. Proper exposure would then be equated to practice. Nothing could be further from the truth. If simple exposure of a good idea meant practice of that idea then change would be a constant in our schools rather than an infrequent accomplishment. It almost seems as if there were a high wall between exposure and practice that must somehow be scaled or torn down if we are going to obtain new practices.

Edgar Dale did a famous piece in his NEWSLETTER entitled "Good Reasons For Doing Nothing."

1a. The proposal would set a precedent.

1b. There is no precedent to guide us.

2a. We have not yet conclusively proved that the old method can't be made to work.

2b. We have not yet conclusively proved that the new method will work.

3. The proposal is just another fad.

4. The time is not ripe.

5. The situation is hopeless.

6. We can't afford it.

7. It is a controversial issue.

The problem of changing teachers is desirable and observable ways is quite similar to the teacher's problem in changing children. Presenting

skills, attitude, force, knowledge, etc. to our students to be more effective in changing them in desirable ways than some of the instant learning machines that have been invented by our technicians.

Changing our students from present characteristics to desired characteristics involves a series of steps. A similar series of steps is necessary to change teachers in desirable ways. Teachers, like students, oftentimes accept the form of change without accepting the real intent of the change. The content of the teacher substituting projection for the theoretical chalkboard presentation is a case in point.

We sometimes look with longing at the way innovation is accomplished outside of the educational enterprise. When an innovation is developed in an automobile factory by inventors or researchers, it is presented directly to management. Management then determines whether the innovation is appropriate by evaluating its themselves and obtaining advice of consultants. A decision is then made. If it is a decision to use the innovation, a directive is issued to those on the production line and innovation results. Academic freedom is certainly an obstacle to this kind of progress.

Maybe farmers are more or like teachers. Lionberger made a study of the adoption of new ideas and practices by farmers. He found that awareness and adoption of a new idea were separated by three very important steps. The farmer must develop an interest in the new idea. He must personally evaluate the new idea. He must personally try out the new idea; and if the results of all of these steps are positive, then there is a good chance that he might adopt the new idea.

Gallagher and Hahn have outlined four essential steps in getting a new idea accepted by classroom teachers. We must first have the idea generated by research. This is generally done by university-based personnel who have the time, resources, talent and climate for creating new knowledge, new

ideas and conducting the initial tryout. An essential ingredient to the creation of new ideas for improvement of education must be the right to be wrong. The fear of possible failure keeps many educators from trying out potentially good ideas. After an idea is created, it must go through a period of development. During this period it must be organized, packaged, tried out under various conditions, evaluated and tested. Development must be followed by diffusion. During this period, the new idea must be demonstrated, explained, implemented and individually assessed by a variety of practitioners in a variety of settings. If the idea appears to be valuable enough to offset the various costs involved in change then the idea should be adopted by a majority of the people involved. This may take a long time. It will require many trials, installation in a variety of situations, modification of related factors and acceptance on a voluntary basis by each of the prime human responsible for education in our classrooms. Paul Hurt, some years ago, determined that it took about fifty years from the generation of a good new idea to its adoption in a majority of classrooms. There is considerable evidence today that we are speeding up this process.

Herbert Knight developed six principles that seem to hasten the acceptance of a new idea.

1. The first impression is very important. It is easier to create a favorable attitude than it is to change a negative attitude.
2. People are more inclined to accept new ideas from persons whom they respect.
3. People and teachers tend to accept what they believe they "figured out for themselves."
4. An individual is likely to accept a message or new idea if such acceptance offers an immediate and personal reward.
5. People generally are less apt to accept a new device if a number of technical problems must be mastered before the device can be put to use.

6. Public relations researchers have discovered that most people resent being manipulated by "selling" techniques.

I expect I am on this program because I am in the midst of diffusing or disseminating a new idea which I think has a great deal of merit and which I hope will be adopted by a majority of teachers of the handicapped.

The mediated interaction visual response system invented, researched, and developed at the Northeast Regional Media Center for the Deaf is now in the diffusion stage. We have several installations in operation. In each case, we have a number of students equipped with individual overhead projectors so arranged that the teacher can turn all of them on at once and observe anything that the students have prepared on their individual transparencies. The teacher can determine in her lesson plan what behavior she would like to have the students exhibit in response to her instructions or suggestions. All of the students every time can then write, spell, select, match, oppose, identify, restate, simplify, analyze, synthesize, solve, diagram, draw, sketch, compose, color, complete, chart, or map as necessary. All responses can be inspected immediately and reinforcement or correction can be provided instantly.

Another version of a visual response system is also being researched at this time. It involves individual television cameras focused on students' desks. The teacher has eight small monitors at her desk so that she can literally observe the desk work of eight students almost simultaneously. We say that the important outcome of education is behavior modification. The visual response systems enable teachers to program their teaching so that responses or behavior modification is demanded constantly. They then have the opportunity to observe the behavior and attempt any modifications of it that seem desirable. Performance can be planned, monitored, assessed and reinforced.

It seems to those of us who are working directly with this system that it is an innovation that should be used in most schools for the handicapped. A common arrangement is to set up a visual response laboratory through which the teachers can rotate their classes when the time is ripe for drill or other response to material that has been taught to them as a group or studied by them as individuals.

But we are a very long way from adoption to a majority of classrooms.

Wesley Meierhenry's quotation concerning innovation provides a little consolation. "The reluctance to change on the part of educators and school systems represents a paradoxical situation. Teaching and learning consists of trying to bring about behavior changes. The purpose of education is to develop individuals who are adaptive, creative individuals. Therefore, all the efforts of the teacher and the major purpose of the educational enterprise is to bring about planned change in the individual. Why persons who are committed to this kind of objective for all the pupils for whom they have responsibility should reject or be neutral about planned change in their own practices as teachers is a greeting and perplexing question.

An Application of a Total Information Packaging System For Dissemination of Research Products

W. Stephen Lilly
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ABSTRACT

The purpose of this project is to develop, field test, and distribute an information package which presents the Experimental Learning Project. The package will be aimed at local school administrators, and will be designed to provide all relevant information needed to make a preliminary decision with regard to value of the program, procedures and problems in implementing the program, and administrative actions and constraints involved in adopting the program. In addition, the package will enable the administrator to communicate the aims and procedures of ELP to other interested persons.

Dissemination of relevant research results to practitioners has become a prime concern of educational researchers. The assumption underlying this proposal is that journal and convention reports are inadequate for bringing about changes in educational practice on the basis of research findings. Both target audiences and presentation modes must be carefully considered if we hope to translate research into practice.

The information package presented herein will contain a 30-minute 16mm film (contingent upon further funding), a series of nine sequenced audio-file strip presentations on varying aspects of the ELP program, a bound volume of all written materials concerning the ELP project, and approximately 100 brochures describing ELP with lay personnel as a target audience. A prototype package will be developed, and will undergo two field tests and revisions prior to final production. The product will be distributed to all Regional RDC/S's and State Departments of Education, and selected Associate RDC/S. A follow up will be conducted to determine the extent of use during the first year of availability.

INTRODUCTION

The purpose of this project is to develop an information package for dissemination of information concerning the Experimental Learning Project (ELP), a four year research program funded by the Division of Research, Bureau for Education of the Handicapped. The objective of ELP has been to develop and collect systematic data on a classroom management system which enables teachers to help children channel their behaviors into appropriate academic and social areas. The project has dealt with what are generally called "behaviorally disordered" or "emotionally disturbed" children, in segregated classroom settings, but this in no way precludes the application of principles and procedures derived in ELP to more heterogeneous classroom settings. The project will be described in more detail in following sections of this paper; suffice it to say that ELP has been a highly successful project, and that the outcomes of this research program are considered to be generalizable and potentially very useful for present planners of educational environments.

The present concern is with the efficient and effective dissemination of products from the Experimental Learning Project, to key strategists and decision makers in the educational hierarchy. James Allen, former U. S. Commissioner of Education, has stated: "Our first goal must be to get the good new ideas and practices into use and get them there quickly. In the past, much of what we have so laboriously learned about educational

theory and practice has been, to say the least, under advertised, poorly packaged, and thinly distributed." This same theme has been stressed by practitioners and educational researchers in the field, and it can safely be said that dissemination of relevant research results has become a major concern in the field of education.

In line with this concern, the products of ELP are being disseminated through the normal channels, i.e., a final report will be submitted to ERIC and several articles will be published in professional journals. This project is based on the assumption, however, that these channels of communication are insufficient for bringing about effective educational change. In short, the initiators of this project are prepared to accept and act upon the following assumptions regarding dissemination of relevant research findings:

1) The printed word is inadequate, in and of itself for conveying research findings to practitioners.
2) In cases in which the printed word is used as a communication device, professional reports tend to be a sterile and non-productive medium for bringing about educational change.
3) Alternatives to written reports in professional journals and convention meetings must be found, if we hope to translate research into practice.
4) Key decision makers with regard to planning specific change in educational programming are generally educational administrators at the local level (as opposed to state administrators and local teachers).

3) Information on new programs must be brought to the attention of those administrators in forms that a) command and keep their attention and interest, and b) provide them with all the relevant information needed to make a preliminary decision concerning the value of the program.

4) The information provided in such packages as outlined in (3) must provide the administrator an opportunity to a) proceed through the program in a logical fashion, b) make a preliminary decision concerning the value of the program, c) answer procedural questions concerning implementation of the program, d) confront problems and special considerations to be taken into account in implementing the program, and e) systematically present information concerning the program to other interested parties, e.g., teachers, superintendents, school board members, federal project coordinators, parents, etc.

It is the aim of this project to translate the Experimental Learning Project into an information package such as that described in (3) and (4) above. This initial package will be field tested with local administrators, revised, packaged, and distributed through the NDPAE/RMC Network, the 10 State Departments of Education, and selected Associate NDPAE's. The remainder of this paper spells out these activities in detail. The following section briefly presents the Experimental Learning Project, and this is followed by an explication of procedures for developing, field testing, and distributing the information package.

EXPERIMENTAL LEARNING PROJECT

The Experimental Learning Project is a programmatic research study that has focused on three primary areas: 1) development of procedures and instruments for identifying deviant children in the classroom setting; 2) development and evaluation of a treatment model that is both efficient and effective in remediating behavioral and academic deficits; and 3) investigations of strategies that will facilitate the generalization and maintenance of treatment gains back to the regular classroom.

In the last four years, a treatment model has been developed and evaluated that is very effective in modifying the behavior of acting-out deviant children in the classroom. The model was implemented in an experimental classroom setting and has three major components. These are token reinforcement, social reinforcement, and time-out procedures. These treatment variables are implemented simultaneously along with a rigorous academic program in the basic skill areas of reading, language, and arithmetic. Children who have been assigned to the experimental classroom have averaged a mean gain of one year in both arithmetic and reading achievement. Strategies have been designed and implemented for programming generalization and maintenance of these gains back to the regular classroom.

PROCEDURES FOR DEVELOPMENT OF DISSEMINATION PACKAGE

As outlined in the introduction, the purpose of this project will be to develop, field test, and distribute an information package which summarizes the Experimental Learning Project. The package will be

aimed at local school administrators, and will be designed to provide: 1) all relevant information needed to make a preliminary decision with regard to value of the program; 2) procedures and problems in implementing the program; and 3) administrative actions and constraints involved in adopting the program. In addition, the package will enable the administrator to communicate the aims and procedures of ELP to other interested persons.

In order to fulfill the objectives as stated, the information package will contain the following elements:

1) A 30-minute, 16mm sound film presenting an overview of the ELP program - This film will present the underlying theory and rationale for the ELP program, as well as operational aspects of the program in the classroom. The focus of the film will narrow from the overview to consideration of specific children and their performance in the program. The purpose of this is to introduce the program, not to provide an in-depth analysis of it. The following materials will provide the latter information (This portion is dependent upon supplemental funding from OSDE-BOE, and will not be included in the initial package).

2) A series of 9 audio-film strip units on varying aspects of the ELP program - These materials are designed to provide in-depth information on the program, and will run approximately 15-20 minutes each. They will be sequential with regard to topics covered, and will be clearly marked to indicate the proper

sequence in which they are to be viewed. A single sheet of paper will be included with the audio-file cover sheet, providing a brief summary of the content of each presentation. The series will be composed of the following nine units:

a) Theory underlying the ELP program - This tape will provide some basic elements of behaviorist theory, upon which the ELP program is based. A constant attempt will be made to relate this theory to actual elements of the ELP program, such as the token economy.

b) Introduction and overview to ELP - This unit will condense information from the 35-minute film, so that basic information concerning the ELP project as it has operated over the past four years will be available to the viewer.

c) Teaching/learning orientation to an ELP program - This presentation will center on the nature of student-teacher interactions and a description of the classroom routine as it exists in an ELP program. The purpose here is to give a "picture" of an ELP classroom in action.

d) Individual case studies - This unit will present two or three selected case studies of children who have been involved in the ELP project over the past four years. Discussion for each child will center on the nature of the problem, methods of diagnosis, educational programming, progress made, and length of stay in the program. Again,

the purpose of this presentation is to provide a look at an ELP classroom, this time from a different point of view.

e) Projected sequence for implementing ELP in a school district - This topic will provide a suggested sequence of activities for operationalizing an ELP program, outlining in as much detail as possible all steps required. This represents a "how to do it" presentation.

f) Implementation considerations I - In this unit, four possible concerns with implementation of the program will be dealt with in some detail. These are: 1) identification and screening procedures for children involved in the program; 2) procedures for integration and coordination of the ELP program with the regular class program in the school; 3) anticipated duration of the ELP program for individual children; and 4) equipment needs for beginning and maintaining an ELP program.

g) Implementation considerations II - This unit will be a continuation of (f), centering on administrative concerns in implementation of ELP in a school district. Topics to be discussed in this presentation are: 1) personnel changes and/or additions required by the ELP program; 2) teacher training and retraining required in implementing the program; 3) budgetary considerations, including anticipated cost breakdowns for beginning an ELP program; and 4) possible sources of funding for ELP projects in local school districts.

k) Interviews with administrators involved in the ELP project - This presentation will focus on a discussion of the administrative aspects of the ELP program, utilizing administrators who have been involved in the ELP project over the past 4 years. The emphasis will be on both benefits accruing from and problems encountered in an ELP program. This unit will also deal with teacher reaction to the program.

l) Research data on program effectiveness - In this unit, data will be presented on the ELP project to indicate its effectiveness with children. Some data will have already been presented in earlier units, but the purpose of this page will be to summarize all relevant data from the project in a manner that it can be presented to interested personnel.

m) Bound copy of final report to USOE as well as other written reports on project - It is felt that any information package on a research project should include full written reports on the project. Obviously, this is not the primary source of information in this package it is, however, the most complete and detailed analysis of the project available, and as such could be available as a reference source. All the reports contained in this package will be bound in book form with hard-bound cover, and page tabs will be utilized to mark all separate reports within the volume, as well as different sections of the main report.

4) Brochures describing benefits of ELP - A brochure will be developed describing, in a highly condensed visual format, the nature and benefits of an ELP program. This brochure will be aimed toward communicating the basic idea of ELP to parents, school board members, and other interested lay personnel. Approximately 100 brochures will be included with each information package, and more will be available if needed.

In summary, the information package will contain the 30-minute 16mm film, a series of nine sequenced audio-film strip presentations on varying aspects of the ELP program, a bound volume of all written materials produced from the ELP project, and approximately 200 brochures describing ELP with lay personnel as a target audience.

The plan of action for this dissemination project calls for development of a working model of the total information package, in close consultation with ELP project personnel. In this prototype, the nine sequenced units will be in the form of a "Sound -on- Slide" presentation, since slides lend themselves to revision much more readily than film strips. In final production, however, the slides will be converted to film strips in order to make the package more immediately usable by the target audiences. Initial production will be followed by a field testing of the model package with 10-15 local school administrators, ranging from superintendents to directors of special education in local districts. As broad a range of administrators as

possible will be chosen for use at this stage, including representation of both urban and rural settings, as well as varying levels of educational background. Each administrator will be asked to review the entire information package, and will then be interviewed concerning the effectiveness of, as well as points of concern with each individual unit in the package. Suggestions will be solicited for improvement of all elements of the information package, and these will be incorporated into a revision of the total package. As mentioned above, an interview technique will be used to obtain information concerning administrator reaction to the package. Each administrator will be paid $50 for his participation in the project.

Once the first revision is complete, a second field testing will be conducted, in the same manner as the first but using different administrator-receivers, and it is anticipated that only minor revisions will result from this field test. The second revision will produce the final product, ready for distribution. At this point, all elements of the package will be submitted to a professional packaging firm, for development of a compact and attractive container for the materials.

Once completed, the information package will be distributed to the 14 National Instructional Materials Centers, the 50 State Departments of Education, and selected Associate SETRC's. In addition, a flyer describing the package, its elements and possible use, will be distributed to all Associate Centers in the country. This flyer will indicate where Associate Center personnel can obtain a review copy of the information package, and

will also include the price for buying the package (at cost) for use through their facilities.

Approximately nine months to a year after the information packages have been distributed, a follow up will be done to determine 1) how much they have been used for the intended purpose, 2) whether such use has resulted in implementation of the ESP program (or planning aimed in this direction), and 3) other uses made of the package, such as in college training programs or in-service education.

It is felt that this type of information package will be potentially very useful to school administrators in making decisions concerning educational programs, and it is hoped that this package will serve as a prototype for others to be developed. Target date for completion and mailing of the information package is May 8, 1971.

COMMUNICATING TECHNOLOGY

Knowledge--Communication, Design

Ted Ward
Michigan State University

G. Joseph Levine
Michigan State University

The title of this session is "Communicating Technology." The conference is entitled National Topical Conference on Instructional Technology. After accepting the responsibility for this session, we tried to become clear on the terminology being used by the conference planners. We tried to understand what is meant by "knowledge" and particularly, we wanted to know how "knowledge" differs from "implementation and utilization," and how this label, in turn, differs from "adoption."

INTRODUCTION

In the words of the conference planners, "instructional technology is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objects, based on research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction." In this framework, knowledge is identified with information based on research or, in the broadest sense, knowledge based on understandings developed through experience and study. That is, knowledge is information objectified to a certain level and therefore, worthy of being considered for implementation and utilization.

Implementation and utilization is the function of putting knowledge to work in such a way that it makes a difference in the way one carries on his particular responsibilities. An example of putting knowledge to work is the refrigerator. Once it is known that the action of harmful microorganisms can be retarded by reducing the temperature of foods, this particular scientific knowledge must be transformed into some implementation and utilization for human good. Therefore, engineers engage in the development of technology. They take this scientific information about the growth and development of microorganisms and couple it with scientific information about how to turn electrical energy into heat-reducing devices and they create an alternative to the old-fashioned ice box. They call it the "refrigerator." Men who put knowledge together to solve human problems are called "engineers." Engineers take scientific propositions from the realms of research, and they bring them together to create new solutions for new or old problems. Once the engineers have fulfilled their role, the fact still remains that many people prefer to use the tried and proven old-fashioned methods--the ice box. Information about the new alternative must be communicated in such a way that people are willing to take a chance on installing this new-fangled device, the refrigerator. The time, ideas, and persuasion, between the actual engineering achievement of the refrigerator and its common acceptance by people involve a time lag: often a greater delay than the time demanded for the technological progress itself. It is not scientific knowledge that is lacking, nor is it engineering know-how. What is lacking is adoption. Adoption is this final step after research, technology and implementation that puts an idea to work in the arena of human affairs for which it was cri-

ginally intended. Within this long and elaborate scheme of considerations, our particular topic today is knowledge about the design of effective communication about the knowledge.

We are obligated to consider two different types of knowledge: First, knowledge is the content of a dissemination message. In this sense, knowledge is what we have to communicate. The second type of knowledge is concerned with what we know about how to communicate. So then, there are two sorts of knowledge: information (i.e., knowledge) that we wish to communicate, and information (knowledge) about the communication process itself. In our presentation today we would like to call your attention to the very important matter about how one goes about designing communication that will deal with dissemination of new knowledge.

INSTRUCTION AND THE TECHNOLOGY OF COMMUNICATION

A word is in order about the difference between instruction and communication: Communication, in its finest form, is an interactive involvement with ideas: instruction carries with it the particular obligation that this interactive involvement with ideas, be extended to the point of changed behavior, so that the learner, through this interaction with ideas and experiences, may be changed in distinct ways according to the objectives of the particular instructional system. Communication of technologies for education is a matter of communicating about the media of instruction. Remember that the definition of media is broad enough to include the non-mechanistic media, such as ordinary talking about ideas on a person-to-person basis, the verbal communication of ideas in groups, and the direct experiences of watching, observing, listening and handling.

Technology for education is not a limited concept. Technology relates to the instructional device or machine, the software for the machine and the system in which the components function; but it indicates much more than this. Technology denotes the particular instructional procedures that use teaching tactics about which scientific information is available. For example, scientific information is available about films and the capabilities of films to affect people; similarly, scientific information is available about print media and even about interpersonal interaction. These, all of these are part of the technology of communication as it relates to instruction. Technology, remember, is the application of particular knowledge to particular tasks or objectives. Science is a basis of knowledge; engineering produces a technology; the basis of converting knowledge to meeting of human needs and the achievement of human goals. Technology is, therefore, interlinked with science. Science is a source, technology is an application. Technology is not merely machines; technology is not merely devices. In education, technology is not merely filmstrip machines, motion picture projectors, or even radio transmitters--but technology is the use of all these with reference to the achievement of specific instructional objectives. Technology, then, for education is largely a matter of procedures, a matter of means, a matter of techniques. We might also say that the word "technology" is becoming the replacement for the old word "methods." The particular difference being that "methods" can be based merely on tradition or habit, whereas, technology demands a base in knowledge, a base in science.

RELEVANT MEDIA

Some attempts to teach methods of instruction to teachers have

been less than successful because of failure to employ the right methods to teach the methods. Lectures are given about the use of discussion groups. Or, discussion groups are employed to teach the uses of tape recordings. Or, tape recordings are used to teach about the use of films. Or, films are used to show examples of team teaching. In effect, we sometimes use an irrelevant medium to teach about some other medium. If the medium is the message, as Marshall McLuhan suggests, we are contradicting ourselves when we use an irrelevant medium to teach about educational technology. Whenever we are trying to impress people with the potentialities of a given instructional procedure, it is preferable to use that medium to demonstrate itself. In such a case there is a consistency, or reinforcement between the medium and the message. Therefore, ideally, films would be used to teach about the use of instructional films; filmstrips would be used to teach about the use of filmstrips. When we are interested in teaching people how to use compressed speech or raising questions about the potentialities of compressed speech, then we ought to use compressed speech to raise these questions and to stimulate these discussions. For example, if your objective is to help teachers become more aware of how instructional games work and how they can be developed, a consistent way to accomplish this would be to design a game. Such a game would teach about games by exposing learners to the design problems involved in building an instructional game. There would be consistency between the medium and the message. This does not argue in the extreme that if the medium and the message are contrasting you cannot teach. But it does suggest that the likelihood of communicating a more clear message is enhanced if there is consistency between medium and message.

PROPOSITIONS

We hope you will see in our presentation examples of several propositions. How well we are able to demonstrate these propositions for you remains for all of us to evaluate when it is over. But, it is our hope that we will not only talk to you about ideas, but we will demonstrate these ideas. As you experience this session we hope you will see ideas more clearly because you have experienced them. This, then, is our first contention on proposition about designing communication of knowledge, that the message that we tend to communicate must be consistent with the behavior we engage in while we communicate it. Or, turning it around, that what we do in sharing an idea must be in harmony with the idea itself. This is illustrated at the college level where students are complaining that teachers do not live out or demonstrate the very things that they claim to believe in.

The question of consistency of medium and message is not always a matter of identical medium and message. The real issue is what do we want to have people do with the new information. If we want them only to know about something, we can often provide this information through some other medium. If on the other hand, we feel that adoption would be enhanced by opportunities to experience more directly the use of the particular technology, we must provide opportunities for people to involve themselves directly with the device. A good illustration of this is what happens in the display booths at professional conventions. When you go to the booth provided by the 3M Corporation you are not only confronted by pictures and tapes describing the use of a new overhead projector system.

but you are given contact with the real thing and encouraged by the layout and the salesmen to actually play with the thing yourself. These brief encounters at professional conferences can hardly qualify as outstanding modes of dissemination, but they nicely illustrate the experience of business and industry, that if people are to be "sold" on something they must have direct experience with it in order to satisfy themselves that, a) they can handle it satisfactorily, b) it will do some of the things that they think are important to be done, and c) it has potentialities into which they can project their own creative thinking.

Several other propositions that undergird communicating about technology in education are drawn from communication theory. One of these propositions is that effective communication involves a cyclic loop. In plain language this means that if we want to effectively communicate we have to listen closely to the feedback we get from people to whom we think we have communicated. Or, looking at it with more care to the detail, communication involves a sender of a message, the message, the medium through which the message is sent, a receiver of the message, the receiver's perception of what the message is all about, then some means for the receiver of the message to send back to the original sender might be able to reshape and resend the message. Its re-sends if there is significant variance between what he intended to say and how he was heard. Thus, when we are attempting to communicate about technology, we need to do it in environments and through procedures that allow for ideas to be communicated, received, commented on, reacted to, and sent back to the original sender. For example, in our presentation today, we are offering two different occasions where, through your discussion questions and interaction we will have an opportunity to reshape the mes-

sage that we are sending. In an ideal environment, feedback from the hearer is prompt--even immediate. We must pay attention to what people are doing with the ideas we are sharing with them. How they are reacting to them, and the points at which there needs to be repair of the message or addition to the message.

The next proposition is that new ideas must be related to previous experiences. If an idea is too "far out" to be understood and accepted, it is probably because the hearer of the new idea has nothing in his own experience to relate it to. He sees the idea as nonsense because he has no reference point. When we are attempting to communicate about a new technology in education we must design the message to carefully relate to something the perceived hearer already understands and is aware of. Thus, we are particularly well advised to relate ideas about instructional media to particular instructional objectives that we know the teacher is concerned about. For example, if the teacher is concerned about teaching the deaf we should relate the particular use we are suggesting for filmstrip use to what it can do for deaf students.

In order to gain understanding, people must interact with ideas. This proposition relates to active rather than passive encounter with a new idea. What is it that produces an active encounter? In order to truly interact with an idea one must put it to use for himself. But, since this sometimes takes time and resources beyond our command, we can provide as a second best alternative at least the opportunity to talk about the implications of an idea. One of the values of discussion groups is to give people a chance to put ideas in their own terms, to hear how they sound, and to thus, become more acquainted with the idea through the

familiarity of shaping it into thoughts and then expressing those thoughts.

To be worthy of acceptance, an idea must meet particular criteria. In a sense, this is the moral problem of dissemination. It is not enough that an idea be new. It must be valuable. If we are to push with equal vigor useful and non-useful ideas we loose credibility. The disseminator of ideas about instructional technology has a particularly demanding role in discriminating between valuable and non-valuable ideas. Of course, this puts a particular demand upon him to be insightful. It seems unfair that a relatively small number of people could serve as a throttle to prevent ideas from reaching the educational marketplace simply because in their limited view the ideas were not useful. Thus, dissemination agents must be well trained, alert, highly sensitive, and highly creative.

As we become more aware of the scientific knowledge about human learning and human communication, we become aware that his knowledge is power, and the technology that we build on this scientific knowledge can render for us a more solid base on which to design educational experiences. Therefore, a principle follows that what can be known about human learning and human communication should be basic to the sort of educational design that we make for the classroom. In this sense, educational design has to do with planning and carrying out of instruction.

Another of the propositions is that people learn more effectively when the goals of the learning experience are understood. Toward this end, we would like to share with you our objectives and to ask you to consider these objectives for yourself during the time we are together. We are particularly interested in having

you experience with us some illustration of the basic principles that we have set forward here with regard to how best to go about communicating information about new instructional technology. We will do this through a series of exercises. First, we are now engaged in an introductory presentation designed to acquaint you with our intentions.

Following this, we will demonstrate compressed speech, one of the newer technologies to modify and augment our use of direct verbal communication. The purpose of this demonstration will be to give you an understanding of the characteristics of compressed speech and to suggest to you some of the potential uses which teachers may be making of this in the years ahead. Following the demonstration of compressed speech we will employ a compressed-speech tape recording to introduce you to some basic concepts about the use of instructional games. As before, our objective will be to inform you about instructional games and the uses that may be made of them in the years ahead. You should be aware that we have drawn these two illustrations for particular purposes that will become clear as the session goes on, but we are not suggesting that they are necessarily the most important two technologies we could discuss today. These are only two of many possibilities. It just happens that these two best serve the purpose of illustrating for you the problems associated with communicating about new technology. Following these tapes we will engage in a live discussion, and, we might hope, a <u>lively</u> discussion, offering you opportunity to raise questions from the floor and to talk about the demonstrations that you have heard. Following the discussion, we will give you an experience in designing an instructional game. This experience relates to our final proposition, that learning is more

likely to be retained when the learner is able to use new information promptly. Thus, you will be able immediately to put to work some of the things that you have learned this hour. Following the game there will be another open discussion in which we consider the possibilities for using games in teaching. Then, we will provide a summary of the whole session in order to bring to your attention the major points and to provide a concluding experience that will encourage you to put these ideas to work.

BUILDING A TECHNOLOGY FOR THE DEVELOPMENT OF EDUCATIONAL PRODUCTS

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In recent years, education has finally developed a reasonably adequate technology. However, at the present time few people in education have any understanding of educational technology and fewer still have ever applied the process to an educational problem. Many educators still seem to vaguely link educational technology with hardware. However, the technology that I refer to is a process. Specifically, it is a systematic process that can be followed in designing, building, evaluating, and improving an instructional process or an educational product. Although most educational processes and educational products involve a mix of both human and nonhuman resources, the presence of nonhuman resources such as computers, videotape recorders and the like, is in no way essential to the technological process.

The Teacher Education Program that I have directed at the Far West Laboratory for Educational Research and Development has built an educational technology that has proven to be effective in the design, development, evaluation, and improvement of educational products. I am here today to describe this technology to you and report some of our experience in applying it to the development of specific teacher education materials.

The educational products that we have been developing at the Far West Laboratory are called Minicourses. A Minicourse is

a carefully tested and validated educational package designed to help teachers improve specific instructional skills. The typical Minicourse deals with about a dozen highly specific teaching skills. During the 15 hours required to complete a Minicourse, the teacher devotes about 6 hours to viewing films which give a precise definition of each skill and show numerous classroom examples of how the skill may be used in regular teaching situations. The remaining 11 hours are devoted to carefully structured teacher practice in simplified teaching situations and self-evaluation and improvement based upon the teacher's analysis of videotape recordings of his own practice lessons.

I believe it will help you to understand the process of educational technology that we have developed if you first have a clear idea of the products that we are building. Therefore, I would like to show you at this time an 8 minute film which is used to introduce the teachers to our first Minicourse. This Minicourse deals with twelve specific skills related to improving the teachers' effectiveness in carrying out a discussion lesson. (Show the Minicourse 1 introduction film at this time.)

Now that you have some idea of the kinds of educational products that we are developing, I would like to review with you the specific educational technology that we employ in developing the Minicourses. Let me call your attention to the handout you have received entitled The 27 Steps in the Development Program. This paper briefly outlines our development process and I will refer to it in describing the various steps involved in that process.

Once we have tentatively identified an instructional area in which a Minicourse appears to be needed, our first step is to carry

out an exhaustive review of the literature related to this area. The review of the literature has several purposes. First, of course, it gives us a clear picture of the state of knowledge in the area in which we have chosen to work. Secondly, it provides us with the information we need to clarify our own objectives and carry out the initial planning necessary before moving into development of the product itself. Finally, it identifies gaps in the current state of knowledge. We sometimes find it necessary to carry out small scale research projects to at least partially fill the more critical gaps that we discover.

At this point it seems appropriate to acquaint you with one of the facts of life that one learns very rapidly when carrying out educational development. This fact is that the amount of solid research data that we have on any subject in education is not likely to be a sufficient foundation for technological development of a new product or process. Furthermore, there are usually so many gaps in our knowledge that if we delay technological development until a firm and complete foundation of research has been built, we will delay for a very long time. Therefore, technological development in education at this time must be built on a combination of research evidence, the insight and knowledge of practitioners in the field, plus a large dose of common sense.

In planning the development of a new educational process or product, I would emphasize two points. The first is that your initial planning should be as thorough and detailed as possible even though it is likely most of your plans will eventually be changed in the light of experience gained during the actual development and evaluation of your product. Perhaps the most important advantage

of a detailed and carefully thought out initial plan is that it gives you a framework upon which changes can be made as the need for change becomes apparent. A thorough plan is also much more useful in helping you identify places where changes are needed. Sketchy plans usually result in a waste of money and time that could have been avoided if you had adequately thought through your project in advance.

The second point I would make about planning is to emphasize the great importance of building very specific objectives to be achieved by the product or process that you plan to develop. If the product you are building is concerned with teaching behavior as is the case with our Minicourses, you should spell out as thoroughly as possible the specific behaviors that teachers will be able to display as a result of completing the training. Let me give you an example of a specific objective for Minicourse 1. This objective states: "Given a discussion lesson, teachers who completed Minicourse 1 will ask questions which, in at least 50 percent of the cases, will require students to use higher cognitive processes rather than recitation of facts. In order for the course to be successful, this objective will be achieved by at least 75 percent of the teachers taking the course." Although such objectives are difficult to build and may all have to be changed as we learn more about the teaching and learning process, they are still extremely important in technological development. Such objectives provide definite goals which are to be achieved as the product progresses through field testing and evaluation. They also provide the developer with a clear definition of failure. A great advantage of a rigorous development process is that it provides evidence of success or failure. In contrast, most processes and products

now in use in education are used year after year without anyone knowing whether they achieve their objectives.

Once planning has been completed, the next step in the technological development of an educational product is to build a prototype. This prototype should be built at a minimum cost and with a minimum of unnecessary embellishments. However, the product should be as good as you are able to build it in its essential elements. Thus, we know that simple clear illustrations tend to help the learning process. We also know, however, that beautifully done color illustrations are of no more value to learning than crudely done black and white illustrations provided only that the latter are clear and understandable.

Once we have developed the preliminary form of our educational product, the next step is to take it to the field and try it out in as realistic conditions as possible. Educational products must be evaluated in terms of their effectiveness under field conditions. Therefore, Laboratory data or data collected under highly artificial field conditions are of limited value. We generally look for two things in field testing a Minicourse. One is the perceptions of the user. His perceptions of the product are very important since a product which is disliked by the user has very little chance of making any real change in the educational process. The second thing we evaluate, of course, is the degree to which the product meets its objectives. To bring about educational improvement, a new product or process must meet both of these conditions.

The feedback that we obtain from field testing is, of course, brought back into the Laboratory and used as a basis for revising

the Minicourses. This revision is again tested in the field and feedback and evaluation data are again obtained. This cycle of field test, evaluate, revise should be continued until the product meets its educational objectives and is perceived favorably by most users. You will note on the handout that Minicourses typically undergo three field tests and revisions. Each field test in our cycle of technological development has slightly different purposes but the basic purpose, that is, evaluating the product's effectiveness and getting feedback for further improvement is essentially the same. We have found three field tests to be sufficient for most Minicourses although on a few occasions a fourth test has been necessary in order to bring the course up to the point where its educational objectives are met. The final steps in the development of Minicourses are aimed at preparing the course for widespread use, disseminating the course and assisting with its implementation in the schools. At present, we feel much less confident of our ability to disseminate our courses and bring about their widespread use than we do in our ability to develop courses that bring about substantial improvements in teaching. Our courses are currently being released by a commercial publisher, but I do not really know whether this is the best approach to achieve widespread implementation. The advantages of the commercial publisher are, briefly, that such publishers are experienced in widespread product dissemination and have a corps of trained salesmen in the field who are already in contact with educators. Surely, the biggest disadvantage of the commercial publisher is that the cost of an educational product goes up a great deal when it is distributed through commer-

cial channels.

I would like to make one additional point concerning the use of a rigorous technological development process, that is, this type of work is difficult, time consuming, and expensive. To date, we have completed our development work on five Minicourses. By this I mean that these courses have been developed, field tested and revised at least three times. We have obtained rigorous evaluation data concerning the performance of teachers taking the courses and, finally, we have readied the courses for commercial distribution. The average cost of developing a Minicourse has been nearly $137,000. Of this amount, review of the literature and planning has cost about $8,000. Carrying out field tests and evaluating the results of these tests for each course has cost an average of $40,000. Developing the initial form of the course and making major revisions after the field tests has cost approximately $52,000. The remaining $7,000 has been devoted to preparation of final reports and expenses incurred in dissemination and implementation. However, it should be remembered that most of the dissemination and implementation costs are borne by the commercial publisher. The cost to the publisher of taking a fully developed and tested Minicourse, producing this course commercially and putting it on the market has been about $30,000 per course.

In view of these costs, you may ask: Is rigorous technological development of educational products really feasible from an economic standpoint? I would assert most strongly that it is for two important reasons. First, this type of development leads to real improvement in education, that is, a product developed following the pro-

case that we use at the Far West Laboratory is demonstrably superior and, since it involves training teachers, can be expected to have a long-range effect on the learning of a great many children for each teacher who is trained. The second reason that I regard such development to be a wise educational investment is that, although the cost of developing an educational product is high, if such products are broadly implemented, the unit cost per user of such development is small. Let us take Minicourse 1 as an example. This course was designed primarily to improve the class discussion teaching skills of intermediate grade teachers. There are over 600,000 intermediate grade teachers in the United States. If only one out of ten of these teachers takes the course, the development cost per teacher will be less than $1.75. Thus, although educational development is expensive, the unit development costs become small if the improved product can be disseminated widely in the field.